THE BRUNSWIK SOCIETY NEWSLETTER

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Dynamic Contexts Provide Framework for Research

Berndt Brehmer, Uppsala University

The main focus of our present work is dynamic decision making, but we also do some more traditional Brunswikian work. We are following five different lines:

1. We study the effects of various *task variables upon individual decision making* in dynamic contexts. This work relies on the DESSY methodology and our theoretical analyses of the nature of dynamic tasks. Current work focuses upon the effects of feedback delays, especially the effects of different locations of the delays. We will also analyze the effects of decision making in real time (as the subjects do in the DESSY experiments) compared to decision making in discretized versions of dynamic tasks, that is, tasks where time has been cut up into trials (as the subjects do in everybody else's experiments on dynamic decision making).

2. We are working on an *extension* of the DESSY methodology *to the study of distributed decision making* in dynamic contexts. Each subject will have control over one or more of the necessary control actions (e.g., each subject might control one fire fighting unit in the case of fire fighting), and we will then examine how the subjects manage to coordinate their actions with different forms of organizational architectures and forms of communication.

3. We are analyzing possible *decision aids* for dynamic decision making. This involves both designing different aids and development of new methods for analysis of performance in dynamic tasks. The latter work focuses on the possibilities of "dynamic policy capturing," a method that would enable people to communicate what they know about a dynamic task by designing simulations.

4. We are trying to extend our *applied work* to problems in process control in industry and intensive care in hospitals. We are also continuing our earlier work on organizations for emergency management.

5. We also do some work along more traditional Brunswikian lines. This work is concerned with *methodological aspects of policy capturing*, with *subjects' understanding of the probabilistic nature of inference tasks*, and the problem of how subjects *test hypotheses* in probabilistic tasks.

THIRD ANNUAL INTERNATIONAL INVITATIONAL MEETING OF THE BRUNSWIK SOCIETY

Saturday, November 7, 1987

Carlsbad Room, Holiday Inn Crowne Plaza, Seattle, WA

8:00	- 8:30	Get reacquainted
8:30	- 9:00	New concepts in Brunswikian theory: Dynamic tasks at last! Kenneth Hammond
9:00	- 9:15	Discussion Joshua Klayman, Chair
9:15	- 10:00	Judgments of Risk Timothy Earle, Jeryl Mumpower, John Rohrbaugh
10:00	- 10:30	Break
10:30	- 12:00	Medical Applications: Issues and Answers John Gillis, Anthony LaDuca, Roy Poses, Marilyn Rothert, Robert Wigton
12:00	- 1:30	Lunch
1:30	- 3:00	Research presentations Manipulating the ecological reliability of cues and feedback Mike Doherty Judgment analysis and expert systems: An empirical comparison. Thomas Stewart Causal maps in dynamic decisionmaking tasks Robin Hogarth Do toilets really swirl the other direction in Australia? Alex Wearing
3:00	- 3:30	Break
3:30	- 4:30	Group discussion - Whither Brunswikia? Berndt Brehmer, Chair
4:30	- 5:00	Computer Program Development John Rohrbaugh, Robert Wigton
5:00		Adjourn

Clinical Judgment Analysis Programs Developed

Anthony LaDuca, National Board of Medical Examiners

The Clinical Judgment Analysis (CJA) project at the NBME has been approved for continued internal support through 1988. Of equal importance, the CJA project has been located in the newly-established Department of Educational Services. This shift is more than cosmetic, because the emerging program of the department is focussed on processes of education, that is, instruction, rather than testing/assessment/evaluation. Therefore, the character of the project will be modified to emphasize the application of SJT to teaching physicians (and possibly medical students) how to make clinical judgments.

At this writing, we have a working prototype of a computer-based, instructional program on office management of patients with previously diagnosed congestive heart failure. This is only one of a battery of clinical tasks under development related to the management of ambulatory adult patients with chronic illness. (Prototype tests of these clinical tasks had been prepared earlier.) The other chronic illnesses include diabetes mellitus Type II, chronic obstructive pulmonary disease (COPD), peptic ulcer disease, hypertension and depression. For the present there are no plans to develop tasks related to diagnosis of acute illness in patients seen for the first time, or for emergency situations.

These CJA instructional programs are intended for use by practicing physicians as part of their continuing medical education, and by residents in the course of their training. Use by medical students during their clinical clerkships is also possible. As part of the development process, we are negotiating a collaborative arrangement with a medical school in Philadelphia. The hope is that similar arrangements will be made with other medical schools during 1988.

Research is being directed at methods for developing the clinical ecologies (criterion models) for the judgment tasks. We are investigating stimulated recall following patient encounters, and the aggregation of experts' policies using cluster analysis.

Two of my colleagues and I have authored an article that will be published in *Evaluation & the Health Professions* in 1988. It describes results of our preliminary application of SJT to assessment of physicians' clinical judgment, and is aimed at an audience that is largely unfamiliar with Brunswikian psychology and SJT.

Brunswikians Lead Double Lives

Timothy Earle, Battelle

At past Brunswikian gatherings, I have been struck by the apparent double lives led by many of us. That is, we do whatever research it is we get paid to do, and we do a little Brunswik on the side. But perhaps I saw this in others only because I felt it so strongly in myself. In my case, my interests have been risk judgment research, on the one hand, and Brunswikian psychology on the other. Until recently, I saw no need explicitly to mix the two. Recently, however, an opportunity to look at risk judgment from a Brunswikian perspective was given me. To my surprise, I learned a lot. Specifically, I learned something that Ken has been preaching for many years; that is, the utility of the Brunswik/Hammond methods for connecting individual judgment with interpersonal conflict management. This connection is particularly important in risk judgment research today because of the current great interest in risk communication. The Brunswik/Hammond approach appears to be ideally suited to the problem of risk communication, which can be reformulated as the problem of risk-conflict management. In related new work, I am currently in the planning stages of a large-scale project that will result in the production of several films on risk communication. My challenge, clearly, is to infuse into them as much of the flavor and substance of Brunswik as my engineering-oriented sponsors will swallow.

Belief Updating, Risk and Ambiguity, Dynamic Tasks Generate Interest

Robin Hogarth, University of Chicago

I am currently engaged in three projects. These are, going from the most to least developed, (1) a model of belief updating, (2) a theoretical and experimental investigation of probability x utility interactions in decision making under risk and ambiguity, and (3) an investigation of how people develop "causal maps" in dynamic decision making tasks. If enough progress is made between now and November 7, I'd like to talk about the third project but I don't want to promise something I can't deliver.

Effectiveness of Human Machine Allocation Scheme Depends on Diagnosticity of Cues

Len Adelman, George Mason University

We've been studying the relative effectiveness of different human-machine allocation schemes for supporting judgment in an air defense environment. The task is to identify incoming aircraft as friend or foe. Aircraft are displayed on a representative radar scope. Subjects, who in our case were actual air defense operators, had to utilize various graphic and tabular cues to perform the task. In contrast with previous research, we developed our simulation of 200 aircraft by (1) working with retired Army air defense operators to identify the relative diagnosticity of the different cues, and (2) structuring the simulation so that the overall proportion of aircraft with different levels of diagnosticity was representative of the task environment. And, in contrast with previous research that had demonstrated the superiority of one type of human-machine allocation scheme, we demonstrated that the relative effectiveness of different human-machine allocation schemes depended on the diagnositicity of the incoming aircraft. Moreover, we demonstrated that this dependency was a function of different allocation schemes fostering different information processing strategies.

Judgment of Likelihood of Bacteremia, Pharyngitis, and Survival of Patients in Intensive Care Topics of Study

Roy M. Poses, Medical College of Virginia

My main interest has been how physicians make clinical judgments and how their decisions are linked to these judgments. I have for the most part confined my work to judgments made for actual patients, not simulations or vignettes. I have studied physicians' judgments of the likelihood of streptococcal pharyngitis for patients with sore throats, the likelihood of survival for patients admitted to intensive care units, and the likelihood of bacteremia for patients undergoing blood cultures. In each case, I have tried to develop or will try to develop multivariate regression models of the physicians' judgments using clinically and cognitively relevant variables. Our initial work regarding streptococcal pharyngitis suggested that physicians often use clinically plausible but not necessarily highly predictive clinical variables, and that they may be influenced by value-induced bias (the confounding of the likelihood of an outcome with its importance). I believe that multivariate models of medical judgment will be increasingly important, especially as we develop more and better objective models of medical outcomes.

Assessment of Women's Judgments on Estrogen Replacement Therapy Carried out in Michigan

Marilyn Rothert, Michigan State University

This past year we completed the study to validate the use of written cases to study clinical judgment (funded by NCHSR, David Rovner, PI). Major findings were:

1. Policies can be captured which reflect actual behavior for an acute condition.
2. Written cases led to a higher number of tests ordered than clinical situations.
3. It is difficult to obtain the data needed to design a set of representative cases for clinical situations.
4. Chronic disease situations must have time as a factor.

We are now studying women's judgments regarding estrogen replacement therapy (funded by Center for Nursing Research, Marilyn Rothert, PI). In addition to policy capturing, the study includes assessment of knowledge, symptoms, and perceptions related to menopause, sociodemographic information and strategies for self care. Following the policy capturing, we will do cluster analyses, using the instruments as covariates. Selecting a subsample from the clusters, we will do a protocol analysis to help us understand how women approach this decision and help us interpret the policy capturing data. While data collection is still underway, preliminary analysis of the first 60 subjects indicate:

Women may consider hot flashes more important than osteoporosis or cancer.
Women are not well informed.
Women identify a large number of symptoms as related to menopause.

In addition to Rovner and Rothert, the multidisciplinary research group includes presently Barbara Given, Margaret Holmes, Neal Schmitt, and Geraldine Talarczyk.

Cognitive Deficits in Depression Examined

John S. Gillis, Oregon State University and Patricia Post, Texas Tech University

The view that cognitive distortions may play a critical role in depression has gained widespread acceptance in recent years. The specific nature of these deficits remains unclear however and many of those suggested by clinical observers have yet to be demonstrated in controlled investigations.

The present study examined two forms of deficit believed to characterize depression: problems in dealing with uncertainty and cognitive inflexibility or the inability to shift set. Eight college students were classified as depressed or nondepressed on the basis of their scores on the Beck Depression Inventory. Scores for the 40 subjects categorized "depressed" indicated mild to moderate levels of depression, the mean score (18.3) being in the moderate range. Nondepressed subjects all had scores of less than 4.

Cognitive performance was assessed on a series of multiple-cue probability learning tasks. These techniques provided a unique means of examining both flexibility and effectiveness of performance under uncertain conditions. Two forms of the tasks were constructed, one (high certainty) in which the criterion was highly predictable (R^2=.90) on the basis of the three cues which a subject had available and another (low certainty) in which the cue-criterion relationship was much less predictable (R^2=.75). Tasks further required that subjects change set in order to perform effectively. After the first block of 40 trials in which they learned a specific pattern of cue dependencies (i.e., cue B was highly correlated with the criterion while cues A and C were irrelevant) cue validities were changed. The second block of 40 trials required subjects to depend upon a previously invalid cue and ignore the earlier valid one. A shift in set or strategy was thus required for continued successful performance.

Results indicated that while depressed subjects learned the tasks as well as nondepressed individuals during the initial block of trials, they were significantly impaired in adapting to the shift in cue validities. Levels of uncertainty did not differentially effect the depressed group however, all subjects performing best in the high certainty conditions.

Implications for research on cognitive deficits in depression are considered.

Volunteers for Drug Testing, Framing Effects Studied

D. Mark Chaput de Saintonge,
London Hospital Medical College

Because of increasing concern over the use of medical study volunteers for drug testing we decided to model their expectations of reward (S$) in terms of features of the study. Extent of previous testing of the drug was overwhelmingly the most important determinant of anticipated reward. Inconvenience rated highly with most clinical students. Students are currently only rewarded for inconvenience in the UK—it is considered unethical to pay them to take risks. This work will continue with a study of how volunteers weigh the risks of adverse drug effects.

Comparison of diagnostic models between physicians and clinical trial lists showed gross discordance creating doubts about the validity of classical clinical trials. We are now investigating pragmatic alternatives which will hopefully be more helpful. Studies of framing effects in the judgment of clinical outcome are due to be completed mid 1988. I look forward to sharing the results with you all in person.

Brunswikian Principles Applied to Weather Forecasting Research

Thomas R. Stewart
University of Colorado, Boulder

I have been using Brunswikian principles in research on weather forecasting. The problems studied include forecasters' use of an advanced interactive computer graphics workstation to decide when to issue warnings for severe weather; forecasting the probability of microbursts at airports; and probabilistic hail forecasts. The results show, not surprisingly, that expert forecasters differ and that judgment analysis can help discover the reasons for those differences. Furthermore, when doing an unfamiliar task, weather forecasters are no better calibrated than other people.

In the hail forecasting study, we found that simple algebraic models, derived using judgment analysis, performed as well as the forecasters themselves and as well as an expert system.

Policy Implications of AIDS, Risk, Negotiation Studied at Suny, Albany

Jeryl Mumpower, Rockefeller College of Public Affairs & Policy

Much of my present work is public policy oriented, and not closely linked to basic issues in Brunswikian theory or research. In this regard, I am presently involved in research on the policy implications of (a) AIDS and other HIV-related diseases and (b) the changing nature of the health care workforce. My recent Brunswikian-oriented work continued to focus on conflict reduction and negotiation. I just completed a paper on the SJT approach to negotiation and mediation, which proposes a general framework and illustrates it by a case study. John Rohrbaugh and I are just initiating a program of research that will focus on the cognitive aspects of two-person negotiations under conditions of differential gain. We are especially interested in those cognitive factors which seem to make it systematically difficult to identify jointly optimal solutions. John and I are also attempting to obtain support for a program of research on group decision support systems for expert judgments of risk.

People Have Better Self-Insights Than Thought Earlier

Michael Doherty, Bowling Green University

We have completed a series of studies on the effects of varying ecological reliability of cues and feedback. Several research paradigms have been used, MCPL, Wason's 2-4-6 task and an artificial universe task. We are also working on a review of the cognitive feedback literature. There was a most surprising finding in a policy capturing study of accounting seniors, which we interpret as indicating that people have vastly better self-insight than hitherto supposed. This study is being replicated.

Do Learning from Feedback, Hypothesis Testing Strategies Fit Together?

Joshua Klayman, University of Chicago

In the past year I have continued to work on my two current interests, learning from feedback and hypothesis testing strategies. I have completed work on an empirical study testing some of the ideas that Young Ha and I developed in our recent *Psych Review* paper. We find that people's tendency to stick to a "+testing strategy" can get them in trouble even when the task is one in which information is forthcoming. I am also writing up the results of two studies on cue discovery in diagnostic judgment with PhD student Kaye Brown. In one, we find that people consider both possible causes and possible effects when attempting to diagnose a fictitious disease: They seem equally amenable to reasoning "backward" and "forward" in causal sequence. However, they seem to learn categorical cues more easily than continuous ones. In the second study, we found that the way in which information was presented during learning sessions can affect the extent to which people encode the true diagnosticity of cues, rather than their "pseudodiagnosticity (a la representativeness). Aside from the new questions these studies raise, I am also thinking about studies that would provide evidence for some speculations in my chapter for the Brehmer & Joyce book concerning how my two interests (hypothesis testing and learning from feedback) fit together.

Brunswikian Projects Underway in Omaha

Robert Wigton, University of Nebraska College of Medicine

1. The effect of cognitive feedback in modifying physicians' judgments on actual patients. Roy Poses, Randy Cebul and I are measuring the change in diagnostic and therapeutic policies of physicians who learned a clinical prediction rule for the diagnosis of strep throat by interacting over a 6 month period with a computer program that provided cognitive feedback on "paper" cases. Physicians at one site are acting as a control for those at another site who received the feedback.

2. New methods for teaching medical ethics using SJT. David Smith and I are using policy capturing to model students' approach to difficult ethical judgments in medical care. These models serve as the basis for discussion of ethical concerns in medical decision making.

3. Effect of cognitive feedback on the selection policies of a medical school admissions committee. Committee members compare the weights derived from their admission recommendations with weights derived from analysis of previous applicants and their subsequent performance.

4. Features important in medical students' choice of medical specialties. Comparison of students' weighting to that of previous graduates is used as a counseling tool and helps them sort out the features of different medical specialties: also provides insights into reasons for increasing specialization among new physicians.

5. Physicians' and patients' perceptions of health risks. Are risks expressed in different forms perceived accurately? What factors affect the impact of communication of health risks?

Dynamic Cognition Under Investigation

Kenneth R. Hammond, University of Colorado

In 1948 I was introduced to Stephen Pepper's *World Hypotheses* and never got over it. Pepper's notion of cognition continuously moving between intuition and analysis and his reasons for this were utterly compelling—to me at least. Beyond research, however. But: (a) combine this idea with that of a cognitive continuum that runs from intuition to analysis; (b) define those polar concepts in behavioral (cognitive) terms; (c) now locate cognitive activity (degree of analysis and intuition employed) on the cognitive continuum at any one point in time (done; see Hammond, Hamm, Grassia, & Pearson); (d) now take the big step; *track movement* of cognition on the cognitive continuum *over time*, and thus test Pepper's hypothesis. Done (see Hammond, Frederick, Robillard, & Victor; I'll show some results). Now I am trying to link these theoretical steps with pattern matching and functional analysis because I believe that experts alternate between these cognitive activities as well as between intuition and analysis. Empirical research is underway with Cindy Lusk and Tom Stewart.

Brunswikian Research Continues in Australia

---UNIVERSITY OF NEW ENGLAND, ARMIDALE---

Ray W. Cooksey
Department of Behavioural Studies in Education

I have nearly completed the analysis of the spelling difficulty study which I described last year where high school students judged the difficulty they would have spelling each of 100 words (produced by their teachers as problematic words). Results so far indicate that the students judge spelling difficulty primarily upon their familiarity with a word (they've seen it before) whereas familiarity is a much less important cue in predicting their actual spelling errors (the ecological criterion). Other important characteristics of words which predicted spelling difficulty included number of silent letters and number of double letters (depending upon the student). An intervention program produced little change in policy parameters except insofar as to slightly increase policy consistency from pre-intervention to post-intervention. I am currently planning a series of Monte Carlo investigations which are designed to examine the viability of the statistical bootstrap (not to be confused with bootstrapping in the decision making sense!) as a way of providing a proper basis for hypothesis tests within a within-subjects regression system such as the lens model produces. Currently, the use of standard statistical tests rests on shaky ground since SJT methods implicitly violate the independence of observations assumption made by such tests. The bootstrap method (devised by Efron in 1979) used the data themselves to build up the sampling distribution necessary for statistical tests by repeated randomly sampling the sample data points (sampling with replacement), computing the statistic of interest, and compiling the distribution of the values of the statistic obtained. Hypotheses are then testable by reference to the empirically generated sampling distribution.

Thus far, the research has examined the utility of the bootstrap for simple correlation and linear regression analysis. However, for SJT purposes, we need to know how the bootstrap would work in multiple regression problems. Any thoughts or comments that the US Brunswikians might have regarding this problem and proposed avenue of investigation would certainly be appreciated.

---UNIVERSITY OF QUEENSLAND---

Steven Schwartz
Department of Psychology

Our work in decision making concentrates entirely on medical problems. At present, we are investigating the value of expert systems as decision aids in diagnosing acute abdominal pain and in the intraoperative monitoring of event-related potentials. We are also involved in a probability learning project which, in its own way, may be described as Brunswikian. The latter project involves teaching medical students to diagnose abdominal pain using computer presented cases and several types of feedback. The set-up differs from some former work on MCPL in several ways. First, the criterion is discrete rather than continuous (a set of diagnoses). Thus, the discriminant function is a better mathematical model than multiple regression. A second difference is that judges are taught a set of conditional probabilities rather than regression weights. Finally, feedback is either outcome only, Bayesian revised probabilities, or rule-based similar to that produced by expert systems. The goal is to examine the efficacy of the various types of feedback in teaching doctors to make probabilistic diagnoses in a domain in which there is considerable overlap among cues. [Note from Ray Cooksey: S. Schwartz and T. Griffin are authors of a recent book entitled "Medical Thinking: The Psychology of Medical Judgment and Decision Making" published by Springer-Verlag, 1986.]

Leonard Dalgleish
Depatment of Social Work

I completed a study early this year using the interpersonal learning paradigm in Suspected Child Abuse and Neglect (SCAN) teams with the aim of reducing the misunderstanding of the judgment policies of the other. There were three teams of sizes 4, 4, and 3. Every person made judgments for themselves on a set of 55 cases and then predicted the judgments of the other team members. Basically there was considerable misunderstanding and after feedback, conducted in pairs, there was significant increase in the similarity (G values) between a person's judgment policy and the predicted policy of the other person.

Timothy Griffin
Department of Psychology

"Brunswik proposed the use of correlations to assess relationships in a probabilistic environment. He could have used conditional probabilities instead; had he done so, he undoubtedly would have built his lens model around Bayes' theorem" (Slovic & Lichtenstein, 1971, p. 665).

This quote represents a conceptual starting point for our research. Although we follow the Brunswikian principle of representative design, we do not employ the lens model approach. The reason for this is that while predictive judgments are important in many real world situations, many, if not most, important decisions are not adequately represented by the lens model. Diagnostic decisions are often made on the basis of information that is available sequentially (or, at least evaluated sequentially) rather than contemporaneously, the amount of information can be controlled by the decision maker and, perhaps most importantly, a categorical decision is required. We have turned to the Bayesian approach which, surprisingly, has been almost completely ignored as a method of training in diagnosis. ["We" includes Steven Schwartz who is Tim Griffin's PhD Supervisor; Len Dalgleish is Associate Supervisor.]

Any comments are most welcome and further details happily furnished.

---UNIVERSITY OF MELBOURNE---

Andrew McKinnon, Department of Psychology

Andrew is working in the area of dynamic decision making (in conjunction with Alex Wearing) and is currently working on adapting a West German simulation system for dynamic decision models for use in his research. His previous work has included the application of systems analysis in understanding dynamic decision tasks and in the psychological interpretation of system parameters associated with the task.

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